pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Commonwealth of Pennsylvania Department of Environmental Protection 2020 Annual Ambient Air Monitoring Network Plan

July 1, 2020

Tom Wolf, Governor
Commonwealth of Pennsylvania

Patrick McDonnell, Secretary
Department of Environmental Protection

www.dep.pa.gov

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List of Acronyms

ACHD	Allegheny County Health Department
AMS	Air Management Services
APCA	Air Pollution Control Act
AQS	Air Quality System
ASOS	Automated Surface Observing System
ATSDR	Agency for Toxic Substances and Disease Registry
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	Carbon monoxide
CSA	Combined Statistical Area
DEP	Pennsylvania Department of Environmental Protection
DRR	Data Requirements Rule
FEM	Federal Equivalent Method
FR	Federal Register
FRM	Federal Reference Method
H_2S	Hydrogen sulfide
HAP	Hazardous Air Pollutant
KJST	John Murtha Johnstown-Cambria County Airport
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NASA	National Aeronautics and Space Administration
NCore	National Core multipollutant monitoring station
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
OMB	Office of Management and Budget
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
Pb-TSP	Lead collected in Total Suspended Particulate
PM	Particulate Matter
PM_{10}	Particulate Matter <= 10 microns in diameter
$PM_{2.5}$	Particulate Matter <= 2.5 microns in diameter
PQAO	Primary Quality Assurance Organization
PWEI	Population-Weighted Emission Index
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur dioxide
SPM	Special Purpose Monitor
TAD	Technical Assistance Document
tpy	tons per year
TSP	Total Suspended Particulate
EPA	Environmental Protection Agency
VOC	Volatile Organic Compound

Introduction

The Federal Air Pollution Control Act of 1955 was the first federal legislation enacted by Congress to provide research and technical assistance to state and local governments responsible for controlling air pollution. This Act appropriated $5 million each fiscal year from July 1955 to June 30, 1960, for the U.S. Department of Health, Education and Welfare to carry out the functions of the Act. The Clean Air Act of 1963 was the first federal legislation establishing a federal air pollution control program within the U.S. Public Health Service and authorized research into techniques for monitoring and controlling air pollution. In 1967, the Air Quality Act was enacted in order to expand federal government activities. In accordance with this law, enforcement proceedings were initiated in areas subject to interstate air pollution transport. As part of these proceedings, the federal government for the first time conducted extensive ambient monitoring studies and stationary source inspections.[1]

In 1970, Congress enacted the Clean Air Act (CAA) authorizing the U.S. Environmental Protection Agency (U.S. EPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants shown to threaten human health and welfare. Primary NAAQS were promulgated by EPA according to criteria designed to protect public health, including an adequate margin of safety to protect sensitive populations including children, asthmatics and the elderly. The secondary NAAQS were promulgated by EPA according to criteria designed to protect public welfare (decreased visibility, damage to crops, vegetation, and buildings, etc.). EPA has promulgated NAAQS for the following pollutants: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and lead (Pb). These pollutants are commonly called the "criteria" pollutants. Table 1 on the following page lists all of the NAAQS for the criteria pollutants and is available at https://www.epa.gov/criteria- air-pollutants/naaqs-table.

In accordance with Section 107 of the CAA, 42 U.S.C. section 7407, after EPA establishes or revises a primary and/or secondary NAAQS, EPA designates areas as "attainment," "nonattainment," or "unclassifiable" areas upon review of certified and quality assured ambient air monitoring data collected by state, local and tribal governments. For areas with nonattainment designations, the state and local agencies must develop and submit to EPA revisions to State Implementation Plans (SIPs) outlining how areas will attain and maintain the standards by reducing air pollutant emissions.

[1] http://www/epa.gov/air/caa/caa_history.html

Table 1. National Ambient Air Quality Standards (NAAQS)

Pollutant [Final Rule Cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		primary and secondary	Rolling 3-month period	0.15 $\mu g/m^3$(1)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb(2)	Annual Mean
Ozone [80 FR 65292, Oct 26, 2015]		primary and secondary	8 hours	0.070 ppm(3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution Dec 14, 2012 [78 FR 3086, Jan 15, 2013]	$PM_{2.5}$	primary	1 year	12.0 $\mu g/m^3$	Annual mean, averaged over 3 years
		secondary	1 year	15.0 $\mu g/m^3$	Annual mean, averaged over 3 years
		primary and secondary	24 hours	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sep 14, 1973]		primary	1 hour	75 ppb(4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 $\mu g/m^3$ as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

The Pennsylvania Air Pollution Control Act (APCA), enacted originally on January 8, 1960, 35 P.S. Section 4001 et seq., established the framework for the Commonwealth's Air Pollution Control Program. The Declaration of Policy set forth in Section 2 of the APCA, 35 P.S. Section 4002, provides as set forth below**:**

It is hereby declared to be the policy of the Commonwealth of Pennsylvania to protect the air resources of the Commonwealth to the degree necessary for the (i) protection of public health, safety and well being of its citizens; (ii) prevention of injury to plant and animal life and to property; (iii) protection of the comfort and convenience of the public and the protection of the recreational resources of the Commonwealth; (iv) development, attraction and expansion of industry, commerce and agriculture; and (v) implementation of the provisions of the Clean Air Act in the Commonwealth.

Section 4 of the APCA empowers the Pennsylvania Department of Environmental Protection (formerly the Department of Environmental Resources and hereafter referred to as "DEP") to implement the provisions of the Clean Air Act in the Commonwealth. 35 P.S. Section 4004(1).

Since its establishment in 1971, DEP has implemented air pollution control programs to protect the air resources of the Commonwealth that, with a great deal of success, have addressed major public health and welfare air quality concerns. Significant changes have occurred over the years with the program, notably with the passage of the Clean Air Act Amendments in 1990 as well as the adoption and implementation of $PM_{2.5}$ NAAQS requirements in 1997. Currently, DEP has an extensive air quality monitoring program that monitors not only for criteria pollutants but also for air toxics and volatile organic compounds (VOCs). A general description of air pollutants is provided in Appendix A of this document.

Ambient Air Monitoring Network Plan Requirements

On March 28, 2016, the United States Environmental Protection Agency (U.S. EPA) promulgated a final rule titled "Revisions to Ambient Monitoring Quality Assurance and Other Requirements" for criteria pollutants. In the preamble, EPA stated that the purpose for the revisions was "to provide clarifications to existing requirements and to reduce the compliance burden of monitoring agencies operating ambient monitoring networks." These revisions focused on the network design and quality assurance requirements set forth in 40 CFR Part 58, "Ambient Air Quality Surveillance," and its associated appendices. Changes to the network design requirements included revisions to required $PM_{2.5}$ sampling frequencies, as well as revisions to requirements for annual network plan, annual data certification and data submission to EPA. Changes to quality assurance requirements included a reformatting of the quality assurance requirements appendix (40 CFR Part 58, Appendix A), revisions to precision check and performance audit concentration levels, revisions to the comparison threshold for collocated lead monitors, as well as revisions to the requirements for the submission of quality assurance data to EPA.

As revised in March 2016, pursuant to 40 CFR Sections 58.10(a) and 58.10(b), network plans must include the following for existing and proposed monitoring sites:

- A statement of whether the operation of each monitor meets the requirements of 40 CFR Part 58, Appendices A, B, C, D, and E, where applicable;
- The Air Quality System (AQS) site identification number;
- The location, including street address and geographical coordinates;
- The sampling and analysis method(s) for each measured parameter;
- The operating schedules for each monitor;
- Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal;
- The monitoring objective and spatial scale of representativeness for each monitor;
- The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS, as described in 40 CFR § 58.30;
- The Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA), or other area represented by the monitor;
- The designation of lead monitors as source-oriented or non-source-oriented;
- Any lead monitor for which a waiver has been requested or granted by EPA to use Pb-PM_{10} monitoring in lieu of Pb-TSP monitoring; and
- The identification of NO_2 monitors as near-road, area-wide or vulnerable or susceptible population monitors in accordance with 40 CFR Appendix D, § 4.3 "Nitrogen Dioxide (NO_2) Design Criteria."

The "Commonwealth of Pennsylvania Department of Environmental Protection 2020 Annual Ambient Air Monitoring Network Plan" has been developed to meet these requirements. The body of this document describes the DEP Ambient Air Network and includes network modifications. Appendix C of this document outlines the fulfillment of network design and quality assurance requirements set forth in the appendices of 40 CFR Part 58. Appendix D of this document provides site and monitor details for all monitoring sites in the DEP Ambient Air Monitoring Network.

Description of DEP's Ambient Air Monitoring Network

Ambient air quality monitoring in Pennsylvania is performed by DEP and local air pollution control agencies in Philadelphia and Allegheny Counties. DEP is primarily responsible for air monitoring in the Commonwealth of Pennsylvania. DEP has approved local monitoring agencies to perform monitoring independently in the two most populous counties in the Commonwealth. The Allegheny County Health Department (ACHD) performs ambient air monitoring in Allegheny County, while the City of Philadelphia Health Department's Air Management Services (AMS) performs ambient air monitoring in Philadelphia County. In addition to monitoring performed in the Commonwealth by DEP, ACHD and AMS, EPA's Clean Air Markets Division operates ozone monitors at five locations in Pennsylvania, as part of the Clean Air Status and Trends Network (CASTNET) program. Contact information for all three ambient air monitoring agencies in Pennsylvania, as well as the CASTNET program, is listed in Table 2.

Table 2. Ambient Air Monitoring Agencies in Pennsylvania

Organization	Address and Phone	Internet
Commonwealth of Pennsylvania Department of Environmental Protection Bureau of Air Quality Division of Air Quality Monitoring	Rachel Carson State Office Building 12th Floor 400 Market Street P.O. Box 8468 Harrisburg, PA 17105-8468 (717) 787-6548	http://www.dep.pa.gov/Business/Air/BAQ/Pages/default.aspx
Allegheny County Health Department	39th Street and Penn Ave. Pittsburgh, PA 15201 (412) 578-8104	http://www.achd.net/air/index.html
City of Philadelphia Department of Public Health Air Management Services	321 University Avenue Philadelphia, PA 19104 (215) 685-7584	http://www.phila.gov/health/airmanagement/ https://www.phila.gov/documents/air-management-reports-and-documents/
CASTNET	US EPA Clean Air Markets Division 1200 Pennsylvania Avenue, NW Mail Code 6204M Washington, DC 20460 (202) 343-9790	http://epa.gov/castnet/javaweb/index.html

This document does not provide detailed descriptions of the monitoring networks operated and maintained by the DEP-approved local air pollution control programs in Philadelphia and Allegheny Counties or EPA networks operated within the state. Detailed descriptions of local networks and plans are submitted to EPA by the local agencies, and may be obtained directly from the agencies, using the contact information listed in Table 2 of this document.

DEP's monitoring strategy generally requires the installation of monitors in areas under DEP's jurisdiction having high population density and/or high levels of contaminants, based on EPA guidance. The Code of Federal Regulations (CFR) sets forth minimum monitoring requirements based, at least in part, on core based statistical area (CBSA) population statistics for ozone, sulfur dioxide, nitrogen dioxide and particulate matter (PM) monitoring networks. As required by the CFR, DEP uses

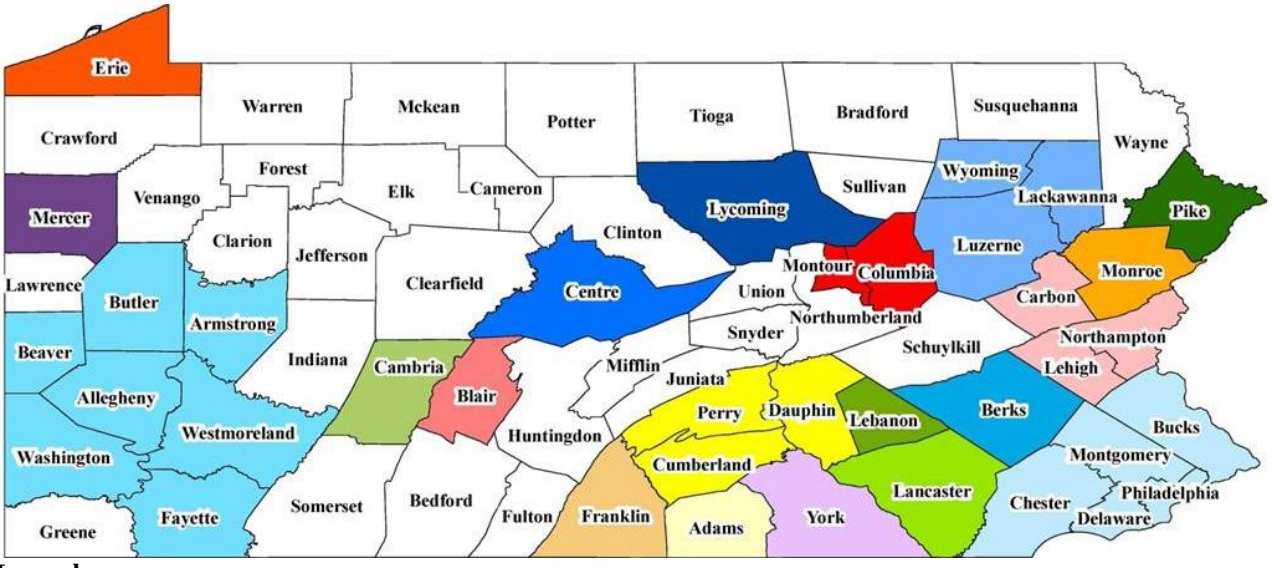
population statistics available from the U.S. Office of Management and Budget (OMB) to identify areas of concentrated populations.

The OMB delineates urbanized areas of concentrated populations into Metropolitan Statistical Areas (MSA) and micropolitan statistical areas. In general, areas with concentrated urban centers of 50,000 or greater are delineated as Metropolitan Statistical Areas (MSA), while areas with concentrated urban centers of 10,000 or greater, but less than 50,000 are delineated as micropolitan statistical areas. Information regarding CBSA delineations can be found on the U.S. Census Bureau's website at https://www.census.gov/programs-surveys/metro-micro/about.html. Population estimates are calculated by OMB and are publicly available from the U.S. Census Bureau at https://data.census.gov.

The Commonwealth of Pennsylvania encompasses thirty-seven defined CBSA, including twenty MSA and seventeen micropolitan statistical areas. DEP conducts air monitoring surveillance in both MSA, micropolitan and non-CBSA regions. CBSA in Pennsylvania are displayed in Figures 1 and 2 on the following pages. In addition, Appendix B of this document contains a list of Pennsylvania counties in each MSA, micropolitan and non-CBSA region, as well as maps of DEP monitoring site locations, for each defined area. Note that several MSAs include populations outside the Commonwealth, as indicated by the inclusion of one or more state abbreviations in the MSA name.

Figure 1 displays the geographical boundaries of MSAs and population estimates for 2018.

Figure 1. Map of Metropolitan Statistical Areas (MSA) in Pennsylvania

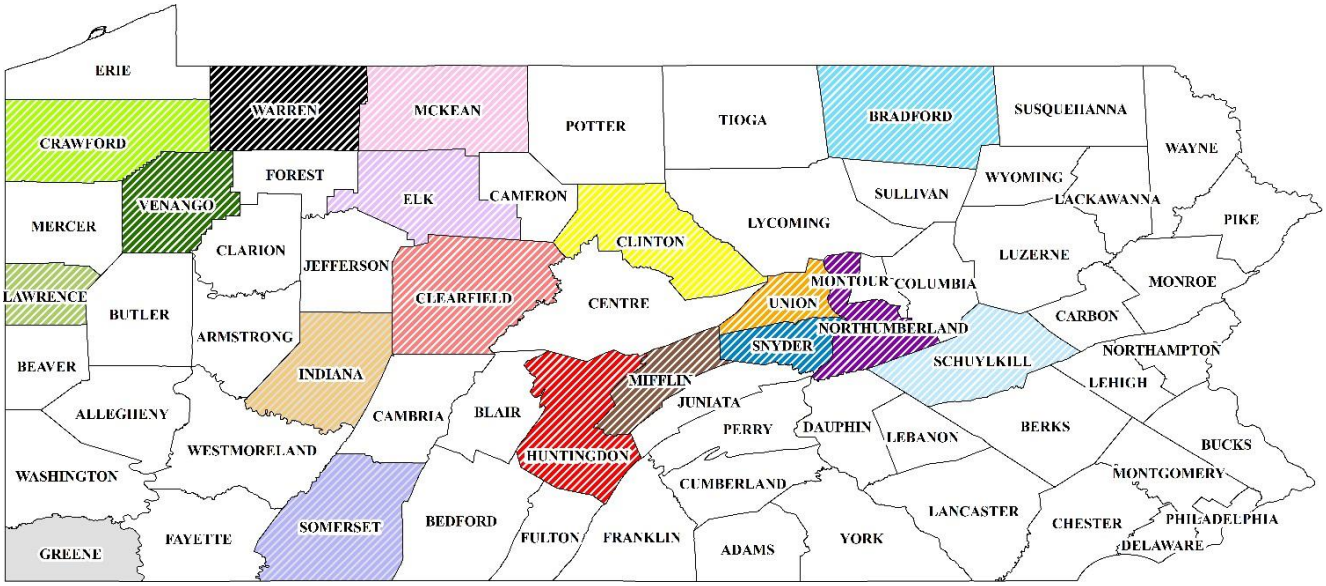


Legend:

MSA	Population	MSA	Population
Allentown-Bethlehem-Easton, PA-NJ	842,913	New York-Newark-Jersey City, NY-NJ-PA	19,979,477
Altoona, PA	122,492	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	6,096,372
Bloomsburg-Berwick, PA	83,696	Pittsburgh, PA	2,324,743
Chambersburg-Waynesboro, PA	154,835	Reading, PA	420,152
East Stroudsburg, PA	169,507	Scranton-Wilkes-Barre-Hazleton, PA	555,485
Erie, PA	272,061	State College, PA	162,805
Gettysburg, PA	102,811	Williamsport, PA	113,664
Harrisburg-Carlisle, PA	574,659	York-Hanover, PA	448,273
Johnstown, PA	131,730	Youngstown-Warren-Boardman, OH-PA	538,952
Lancaster, PA	543,557	Non-MSA Regions	
Lebanon, PA	141,314		

Figure 2 displays the geographical boundaries of micropolitan statistical areas with 2018 population estimates.

Figure 2. Map of Micropolitan Statistical Areas in Pennsylvania



Legend:

MSA		Population	MSA		Population
	Bradford, PA	41,330		Oil City, PA	51,762
	DuBois, PA	79,685		Pottsville, PA	142,569
	Huntingdon, PA	45,491		Sayre, PA	60,853
	Indiana, PA	84,953		Selinsgrove, PA	40,801
	Lewisburg, PA	44,595		Somerset, PA	74,501
	Lewistown, PA	46,388		St Mary's, PA	30,197
	Lock Haven, PA	38,998		Sunbury, PA	92,029
	Meadville, PA	86,159		Warren, PA	39,659
	New Castle, PA	87,069			

Commonwealth of Pennsylvania's Air Monitoring Network – Sites and Pollutants

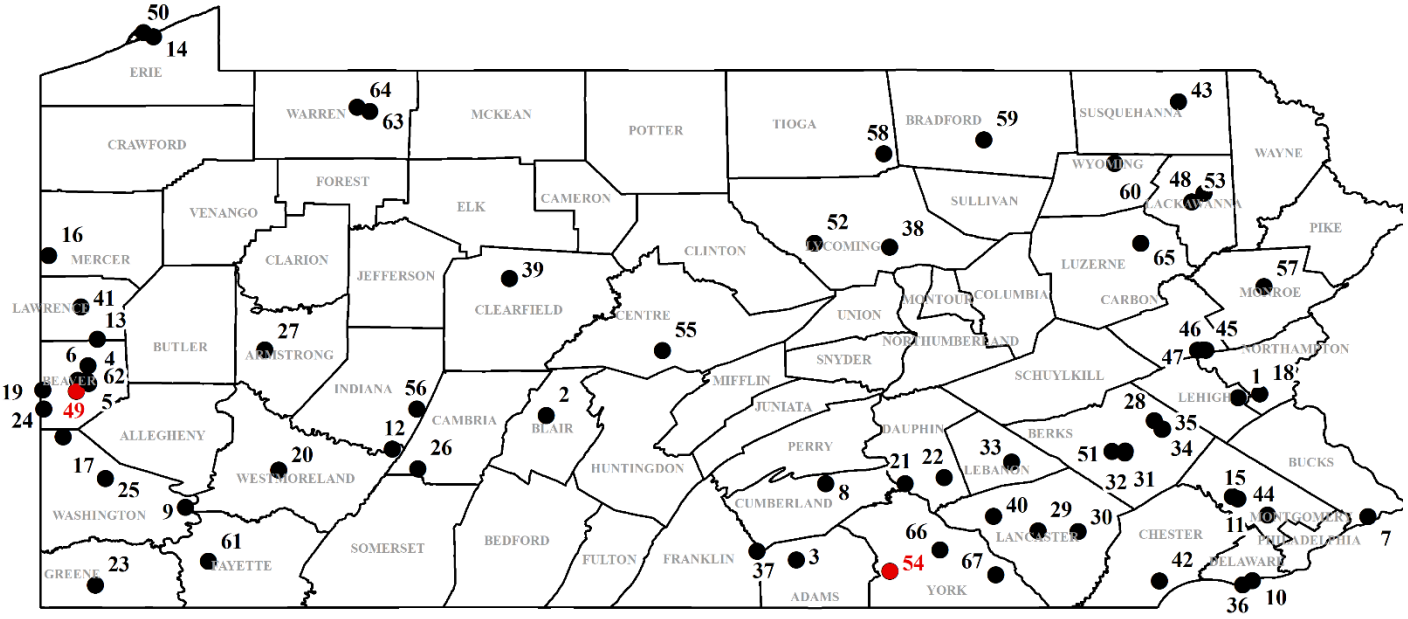
The planned 2020-2021 DEP Air Monitoring Network consists of 65 air monitoring stations, located in 38 of the 67 counties in Pennsylvania, and includes ambient air monitoring sites for criteria pollutants and air toxics, including VOCs. Descriptions of air pollutants are provided in Appendix A of this document. The DEP Air Monitoring Network utilizes both continuous and discrete methods of pollutant sampling.

The continuous portion of the DEP Air Monitoring Network utilizes a totally automatic, microprocessor-controlled system of remote stations throughout the Commonwealth. Continuous methods employ specialized instruments designed to continuously sample and analyze ambient air *in situ*. The output of these devices is hourly pollutant concentrations. These concentrations are the raw data used to calculate design values needed for NAAQS comparisons. The Bureau of Air Quality collects the raw data on an hourly basis, enabling near real-time monitoring. DEP utilizes continuous methods for the criteria pollutants ozone, sulfur dioxide, nitrogen dioxide, oxides of nitrogen, carbon monoxide, $PM_{2.5}$, and PM_{10}. Various meteorological data from many of the monitoring stations are measured using continuous methods as well, including ambient temperature, relative humidity, barometric pressure, wind speed, wind direction, precipitation, and solar radiation.

The non-continuous portion of the DEP Air Monitoring Network utilizes discrete sampling methods for criteria and air toxic pollutants, with analysis of the sample performed at the DEP Bureau of Laboratories. A discrete method is generally defined as a "manual" method of sampling for a defined or "discrete" period of time. Discrete sampling includes both filter-based, sorbent tube and canister-based sampling. For filter-based sampling, air is actively pumped through a filter substrate, onto which air pollutants are trapped. Canister sampling utilizes vacuum pressure to fill a sampling canister over time. DEP utilizes discrete methods for the criteria pollutants $PM_{2.5}$ and lead, as well as air toxics, including heavy metals and VOCs. In addition, DEP conducts filter-based $PM_{2.5}$ speciation monitoring at selected sites. Speciation analysis provides a breakdown of $PM_{2.5}$ constituent compounds. Speciation analysis is performed by approved EPA contractors as part of the Chemical Speciation Network (CSN) program.

The map shown in Figure 3 displays the site locations of all ambient air monitoring stations in the DEP Air Monitoring Network. Table 3 provides a listing of the parameters monitored at each location.

Figure 3. Map of DEP Air Monitoring Network



Legend: RED – Site will be discontinued in 2020-2021**; BLUE** – Site will be added in 2020-2021

Map ID	Site Name	Map ID	Site Name	Map ID	Site Name	Map ID	Site Name
1	Allentown	21	Harrisburg	41	New Castle	61	Uniontown
2	Altoona	22	Hershey	42	New Garden	62	Vanport
3	Arendtsville	23	Holbrook	43	New Milford	63	Warren East
4	Beaver Falls	24	Hookstown	44	Norristown	64	Warren Overlook
5	Beaver Valley	25	Houston	45	Palmerton	65	Wilkes-Barre
6	Brighton Twp	26	Johnstown	46	Palmerton Electric	66	York
7	Bristol	27	Kittanning	47	Palmerton High School	67	York Downwind
8	Carlisle	28	Kutztown	48	Peckville		
9	Charleroi	29	Lancaster	**49**	**Potter Township (Disc)**		
10	Chester	30	Lancaster Downwind	50	Presque Isle		
11	Collegeville	31	Laureldale North	51	Reading Airport		
12	Conemaugh	32	Laureldale South	52	Salladasburg		
13	Ellwood City	33	Lebanon	53	Scranton		
14	Erie	34	Lyons Boro	**54**	**Spring Grove (Disc)**		
15	Evansburg United Methodist	35	Lyons Park	55	State College		
16	Farrell	36	Marcus Hook	56	Strongstown		
17	Florence	37	Methodist Hill	57	Swiftwater		
18	Freemansburg	38	Montoursville	58	Tioga County		
19	Glasgow	39	Moshannon	59	Towanda		
20	Greensburg	40	Mt Joy	60	Tunkhannock		

Table 3. DEP Air Monitoring Network Sites and Parameters Monitored, 2019-2020

Site Name	Criteria Pollutants								Air Toxics			Meteorological Conditions
	Ozone	Sulfur Dioxide	Nitrogen Dioxide	Carbon Monoxide	$PM_{2.5}$	$PM_{2.5}$ Speciation	PM_{10}	Lead	VOC	Carbonyls	Metals	Met Tower (exist. or planned)
Allentown	X				X		X					X
Altoona	X	X			X							X
Arendtsville	X	X	X	X	X	X			X	X		X
Beaver Falls	X		X		X		X					X
Beaver Valley								X	X		X	X
Brighton Twp	X	X										X
Bristol	X											X
Carlisle					X							X
Charleroi	X	X	X		X				X			X
Chester	X		X		X	X		X	X		X	X
Collegeville									X			X
Conemaugh								X				
Ellwood City								X			X	
Erie	X		X	X	X		X		X			X
Evansburg United Methodist									X			
Farrell	X				X							X
Florence	X	X			X	X						X
Freemansburg	X	X	X		X							X
Glasgow											X	X
Greensburg	X				X	X			X			X
Harrisburg	X				X							X
Hershey	X						X					X
Holbrook	X				X							X
Hookstown	X	X										X
Houston	X		X		X				X	X		X
Johnstown	X	X	X	X	X	X	X					X
Kittanning	X				X							X
Kutztown	X											X
Lancaster	X				X	X	X		X	X	X	X
Lancaster Downwind	X				X	X						X
Laureldale North								X				
Laureldale South								X				

Site Name	Criteria Pollutants								Air Toxics			Meteorological Conditions
	Ozone	Sulfur Dioxide	Nitrogen Dioxide	Carbon Monoxide	$PM_{2.5}$	$PM_{2.5}$ Speciation	PM_{10}	Lead	VOC	Carbonyls	Metals	Met Tower (exist. or planned)
Lebanon	X				X	X						X
Lyons Boro								X				
Lyons Park								X				
Marcus Hook					X				X			
Methodist Hill	X											X
Montoursville	X											X
Moshannon	X											X
Mt Joy								X				
New Castle	X											X
New Garden	X				X	X						X
New Milford					X				X	X		X
Norristown	X				X							X
Palmerton								X				
Palmerton Electric											X	X
Palmerton High School								X			X	X
Peckville	X											X
Potter Township (disc)*								**(disc)**				
Presque Isle									X		X	
Reading Airport	X	X			X				X		X	X
Salladasburg					X							X
Scranton	X		X	X	X							X
Spring Grove (disc)		**(disc)**										
State College	X	X	X		X							X
Strongstown	X	X			X							X
Swiftwater	X											X
Tioga County	X		X		X							X
Towanda	X		X		X							X
Tunkhannock					X				X	X		X
Uniontown	X		X		X				X	X		X
Vanport								X				
Warren East		X										X
Warren Overlook		X										X
Wilkes-Barre	X	X					X					X

Site Name	Criteria Pollutants								Air Toxics			Meteorological Conditions
	Ozone	Sulfur Dioxide	Nitrogen Dioxide	Carbon Monoxide	$PM_{2.5}$	$PM_{2.5}$ Speciation	PM_{10}	Lead	VOC	Carbonyls	Metals	Met Tower (exist. or planned)
York	X	X	X		X				X			X
York Downwind	X											X
Totals	***42***	***15***	***14***	***4***	***34***	***9***	***7***	***12***	***17***	***6***	***9***	***55***
(disc) = Site/Monitor will be discontinued in 2020-2021; (add) = Site/Monitor will be added in 2020-2021												

* DEP plans to discontinue the Potter Township site, as described in the "Modifications to Criteria Pollutant Networks" section of its 2019 Annual Network Plan.

Changes to Monitoring Sites and Monitors in 2019-2020

DEP completed several modifications to its air monitoring network during 2019-2020. The changes are summarized in Table 4.

Table 4. Summary of Changes to the DEP Air Monitoring Network, 2019-2020

Establishment of New Monitoring Sites
1) Established Salladsburg (Lycoming County) and Tunkhannock (Wyoming County) SLAMS monitoring sites
2) Establishment of the Palmerton High School (Carbon County) special purpose monitoring (SPM) site
Modifications to Criteria Pollutant Monitoring Networks
1) Discontinued H_2S monitoring at the Warren East (Warren County) monitoring site
2) Discontinued $PM_{2.5}$ Speciation monitoring at the Marcus Hook (Delaware County) monitoring site
3) Relocation of the Lebanon Monitoring Site and Addition of $PM_{2.5}$ Speciation Monitoring
4) Relocation of the Houston (Washington County) monitoring site
5) Relocation of the Strongstown (Indiana County) monitoring site
Modifications to Air Toxics Networks
1) Discontinued the Lewisburg (Union County) monitoring site
2) Relocation of the Presque Isle (Erie County) monitoring site

The sections below discuss the items listed in Table 4 above. None of the changes contained in this section negatively impact DEP's fulfilment of network design criteria. DEP continues to meet its regulatory requirement, such as minimum monitoring based on population, for monitoring ambient air in various portions of the Commonwealth. Additional information on DEP meeting these requirements is outlined in Appendix C: Network Design and Quality Assurance Criteria of this document.

Establishment of New Monitoring Sites

Establishment of Salladasburg and Tunkhannock SLAMS Monitoring Sites

As detailed in the 2019 Ambient Air Monitoring Network Plan, DEP continues to expand its monitoring network in areas of Marcellus Shale gas extraction and transport operations. The Salladasburg (western Lycoming County) monitoring station was installed in July 2019 at the Salladasburg Elementary School and contains $PM_{2.5}$ monitoring equipment. The Tunkhannock (Wyoming County) monitoring station was installed in December 2019 and contains $PM_{2.5}$, carbonyls and VOCs monitoring equipment. In addition, meteorological monitoring is performed at both locations, including ambient temperature, relative humidity, barometric pressure, wind speed, wind direction, precipitation, and solar radiation.

Establishment of Palmerton High School Special Purpose Monitoring (SPM) Site

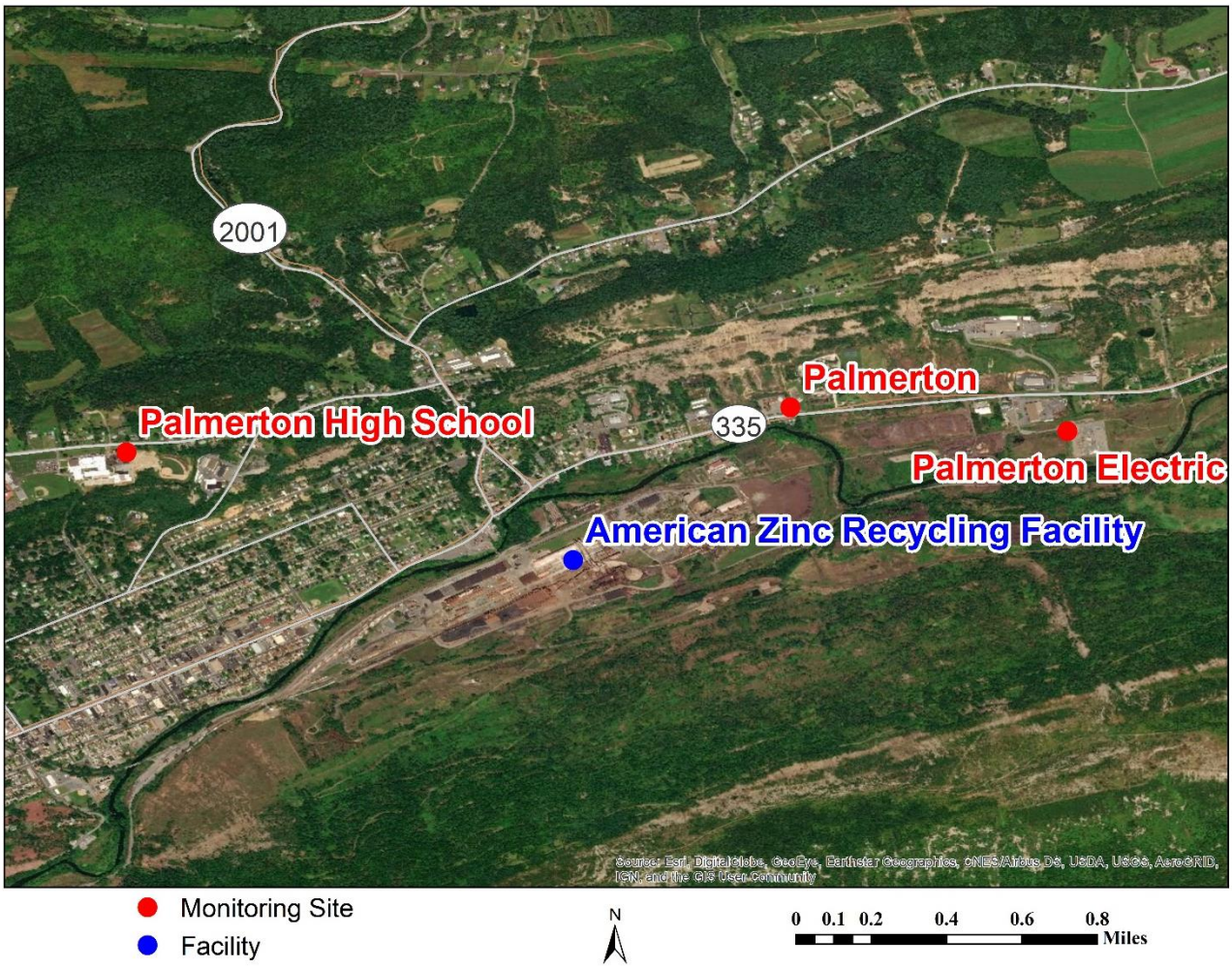
DEP is establishing an SPM monitoring site on the property of Palmerton Area Junior/Senior High School (Carbon County). DEP will perform lead and heavy metals monitoring at this site to evaluate air quality-related impacts from the nearby American Zinc Recycling facility on the local population.

In September 2018, the Pennsylvania Department of Health (DOH) released a health advisory notice outlining the potential for an increased risk of a public health hazard due to lead exposure for persons within three miles of the American Zinc Recycling facility in Palmerton, Pa.[2] DOH issued the health advisory based on a public health consultation released by the federal Agency for Toxic Substances and Disease Registry (ATSDR) in July 2018.[3] In the health consultation letter, ATSDR referenced modeling performed by EPA in consultation with ATSDR, which indicated that maximum ambient lead concentrations may be occurring in areas outside of DEP's current EPA-approved lead monitoring site in Palmerton, Pa. EPA modeling suggested that maximum concentrations occur west/northwest of the American Zinc Recycling facility, and may occur near the Palmerton High Junior/Senior High School in Palmerton, which is of particular concern due to the susceptibly of younger children to lead exposure.

Figure 4 displays the location of the American Zinc Recycling facility, the current DEP Palmerton monitoring locations and the Palmerton Area Jr/Sr High School, in Carbon County, PA. The current DEP monitors are located northeast of the American Zinc Recycling facility. The Palmerton Area Jr/Sr High School is located approximately 0.9 miles northwest of the facility.

[2] https://www.health.pa.gov/topics/Documents/HAN/2019-PAHAN-435-02-08-ADV-Palmerton%20Lead%20Update.pdf
[3] https://www.atsdr.cdc.gov/HAC/pha/AmericanZincRecycling/American_Zinc_Recycling_LCH_508.pdf

Figure 4. Palmerton High School Special Study Map



DEP will conduct ambient criteria lead sampling utilizing the same collection and analysis methodology as used for its NAAQS-comparable lead monitoring sites. DEP will conduct metals sampling utilizing the same collection and analysis methodology as used for its air toxics metals monitoring sites. Target compounds for metals monitoring include antimony, arsenic, beryllium, cadmium, cobalt, chromium, lead,[4] manganese, nickel, selenium and zinc. Onsite meteorological data will be collected using a Met-One AIO 2 monitor to record wind speed, wind direction, ambient temperature, relative humidity and barometric pressure.

The sampling project has a targeted start date of June 1, 2020, and will continue for 1 year from the commencement of sampling. The project will terminate when a minimum of 75% data completeness has been reached or until 62 valid samples have been collected. If lead concentrations exceed 80% of the NAAQS lead standard of 0.15 µg/m^3 (0.12 µg/m^3), or if the metals pose a risk to human health as determined by risk analysis, the site will be evaluated for retention and inclusion as part of the DEP Air Quality monitoring network. Sampling will take place over a 1-year period, following the EPA standard 1-in-6-day sampling schedule, with at least 75% data completeness or until 62 valid samples are collected. If sampling results exceed certain action levels (see Table 5 below) on 3 sampling days

[4] Lead monitoring performed using the air toxic methodology is not NAAQS-comparable

in a rolling quarter, DEP will increase the sampling to 1-in-3-day schedule and investigate the source. DEP's Northeast Regional Office Community Relations Coordinator will notify the community and the school of any changes to the sampling schedule.

Table 5. Comparison Levels for Palmerton High School Air Monitoring

CAS Number	Target Metal Compound	PADEP Action Level ($\mu g/m^3$)	Screening Level ($\mu g/m^3$)	Cancer-based Comparison Level,[a] ($\mu g/m^3$)	Noncancer-based Comparison Level ($\mu g/m^3$)
7439-92-1	Pb - Lead	0.12 (rolling 3-month average)	0.150 (RfC) (rolling 3-month average)		0.150 (NAAQS)
7440-38-2	As - Arsenic	0.0023	0.00023 (URE)	.00023 (IUR)	0.015 (REL)
7440-41-7	Be - Beryllium	0.0042	0.00042 (URE)	.00042	0.020 (RfC)
7440-43-9	Cd - Cadmium	0.0056	0.00056 (URE)	.00056	0.010 (MRL)
7440-47-3	Co - Cobalt	1.0	0.100 (RfC)		0.100 (MRL)
7440-48-4	Cr - Chromium	N/A	N/A		
7439-96-5	Mn - Manganese	3.0	0.300 (Rfc)		0.300 (MRL)
7440-02-0	Ni - Nickel	0.021	0.0021 (URE)	0.0021[c] (IUR)	0.090 (MRL)
7440-36-0	Sb - Antimony	2.0	0.200 (RfC)		0.200[b] (RfC)
7782-49-2	Se - Selenium	200	20 (RfC)		20 (RfC)
7440-66-6	Zn - Zinc	N/A			

[a] Cancer-based comparison level reflects an increased risk level of 1 in a million.
[b] The comparison level for antimony is the RfC for antimony trioxide.
[c] The comparison level for nickel is based on the IUR for nickel subsulfide.

Impacts to the general public will be determined by risk analysis of the sampling results. The risk analysis will be prepared by risk assessors at DEP and corroborated by toxicologists at ATSDR and Pennsylvania Department of Health. Following completion of the study, DEP will prepare a final report, including a health risk assessment, which will be made available to the school and the community. The final report will include historical and sample-day meteorological wind roses, pollution roses for each pollutant and comparison of the concentrations for each pollutant to the NAAQS and nearby monitors.

Modifications to Criteria Pollutant Networks

Discontinued H_2S at the Warren East Site

As discussed in its 2019 Annual Ambient Air Network Plan, DEP discontinued H_2S monitoring at its Warren East monitoring site at the end of December 2019. This monitor was installed at the request of the DEP's North West Regional Office to assist with a series of odor complaints. In consultation with the NWRO this monitor is no longer necessary to support their compliance efforts. Additionally, there are no federal requirements to monitor for this pollutant, and it is not required as part of a nonattainment or maintenance SIP.

Discontinued $PM_{2.5}$ Speciation Monitoring at Marcus Hook Site

As discussed in its 2018 Annual Ambient Air Network Plan, DEP proposed to discontinue $PM_{2.5}$ speciation monitoring at its Chester site, while retaining $PM_{2.5}$ speciation monitoring at its Marcus

Hook site, also in Delaware County. The analysis presented in the 2018 Plan illustrated that the $PM_{2.5}$ sampler at Chester was being influence by a local source. Since then, DEP has reassessed the purposes of its speciation monitors in Delaware County and determined it was better to keep the monitor at Chester, which has been in operation since 1974, than at Marcus Hook, owing to its longer historical data record. Over the next couple of years, however, DEP plans to consolidate its Marcus Hook and Chester $PM_{2.5}$ locations to a new location in Delaware County that is not directly influenced by local stationary sources.

Relocation of the Lebanon Monitoring Site and Addition of $PM_{2.5}$ Speciation Monitoring

On March 27, 2019, a building on the property where DEP's Lebanon monitoring station was located was extensively damaged by a fire. In December 2019, the property owner notified DEP that they would not be rebuilding and that electrical power to the property (and therefore to DEP's monitoring site) would be discontinued. As a result, DEP is relocating its Lebanon monitoring station to the Quittapahilla Educational Wetland Preserve, which is within 0.6 miles west of the current monitoring site. To ensure continuous $PM_{2.5}$ data collection from the site, DEP temporarily relocated the $PM_{2.5}$ FRM monitor on January 24, 2020, to the Preserve location. Following EPA approval on February 26, 2020, DEP is in the process of relocating the entire suite of monitors to the new site. The suite of monitors that will be relocated includes the recent addition of $PM_{2.5}$ speciation monitoring at the Lebanon site.

As discussed in its 2019 Annual Network Plan, DEP planned to install a $PM_{2.5}$ speciation monitor at the Lebanon monitoring site to help determine if the Lancaster Downwind $PM_{2.5}$ monitor is being influenced by local source(s) of emissions. $PM_{2.5}$ speciation monitoring at the Lebanon site should allow DEP to better assess the impacts of ammonia emissions on $PM_{2.5}$ formation specifically in Lebanon County, and also assist in any State Implementation Plan revisions that may be required by a future tightening of the $PM_{2.5}$ NAAQS. DEP installed a $PM_{2.5}$ speciation monitor at the Lebanon monitoring site January 1, 2020, and will reinstall the monitor, along with the remaining suite of monitors, at the new permanent Lebanon site.

The new permanent Lebanon site is expected to be operational by June 1, 2020. EPA has informed DEP that the AQS identification code for the site will not need to be changed due to this relocation. DEP will update the geographic coordinates for the Lebanon monitoring site and add the appropriate comments to the site information in EPA's AQS system, once the relocation is complete.

Relocation of the Houston Monitoring Site

In June 2019, the site operator for the Houston monitoring site informed DEP that new buildings being built by the property owner were encroaching on the monitoring station. To mitigate any possible siting concerns, DEP is relocating the station 370 feet up the hill to the east of the current location on same property. The move is anticipated to take place by June of 2020. DEP will update the geographic coordinates for the Houston monitoring site and add the appropriate comments to the site information in EPA's AQS system, once the relocation is complete.

Relocation of the Strongstown Monitoring Site

In January 2019, the site operator for the Strongstown monitoring site informed DEP that the Pennsylvania Department of Transportation was piling asphalt millings near the monitoring station. To mitigate any possible siting concerns, DEP relocated the Strongstown monitoring station 100 feet to

the northeast of the former location on the same property on June 7, 2019. The site was operational by June 10, 2019.

Modifications to Air Toxics Networks

Discontinued the Lewisburg Monitoring Site

As discussed in its 2019 Annual Network Plan, DEP discontinued air toxics monitoring at its Lewisburg (Union County) monitoring site at the conclusion of its contract with Bucknell University in June 2019. Historical measurement data from the site indicates that air quality in the Lewisburg area (based on the parameters measured) does not pose a health concern.

Relocation of the Presque Isle Monitoring Site

In May 2019, Gannon University informed DEP that due to high water levels on Lake Erie, the area leading to DEP's sampling equipment set-up at Presque Isle State Park is under water. This poses a safety risk to the person attempting to traverse the high waters to service the monitors. Gannon University expressed concerns to DEP regarding the safety of students who collect samples and service the monitoring equipment at this location, and asked DEP if any accommodations could be made to address the safety issues, as water levels are predicted to remain high for many years. To mitigate safety concerns, DEP is working with Presque Isle State Park staff to relocate the monitoring equipment to the north end of Horseshoe Pond, approximately 1.8 miles east of the current monitoring site. The move is anticipated to take place by June of 2020. EPA has informed DEP that the AQS identification code for the site will not need to be changed due to this relocation. DEP will update the geographic coordinates for the Presque Isle monitoring site and add the appropriate comments to the site information in EPA's AQS system, once the relocation is complete.

Site and Monitoring Activity Anticipated within the Next 18 Months

DEP is planning to make changes to its air monitoring network over the next eighteen months. These changes are summarized below in Table 5.

Table 6. Summary of Planned Changes to the DEP Air Monitoring Network, 2020-2021

Changes Relating to Natural Gas Extraction and Processing Activities in Shale Gas Regions
1) Install a $PM_{2.5}$ monitor at the Strongstown (Indiana County) monitoring site
Changes Relating to the Annual Assessment of the Ambient Air Quality Monitoring Network
Modifications to the Criteria Pollutant Networks
1) Discontinue the Spring Grove (York County) monitoring site

Modifications to Air Monitoring Network: Shale Gas Development

The extraction and processing of natural gas from shale gas involves many stages and provides many opportunities for the release of air pollutants during the process. The major stages and infrastructure involved in natural gas extraction and processing include the following: pad, impoundment and road construction; drilling; fracturing; flaring; condensate tanks; compressor stations; and gas processing facilities. In recent years, the number of shale gas wells drilled in Pennsylvania has rapidly increased.

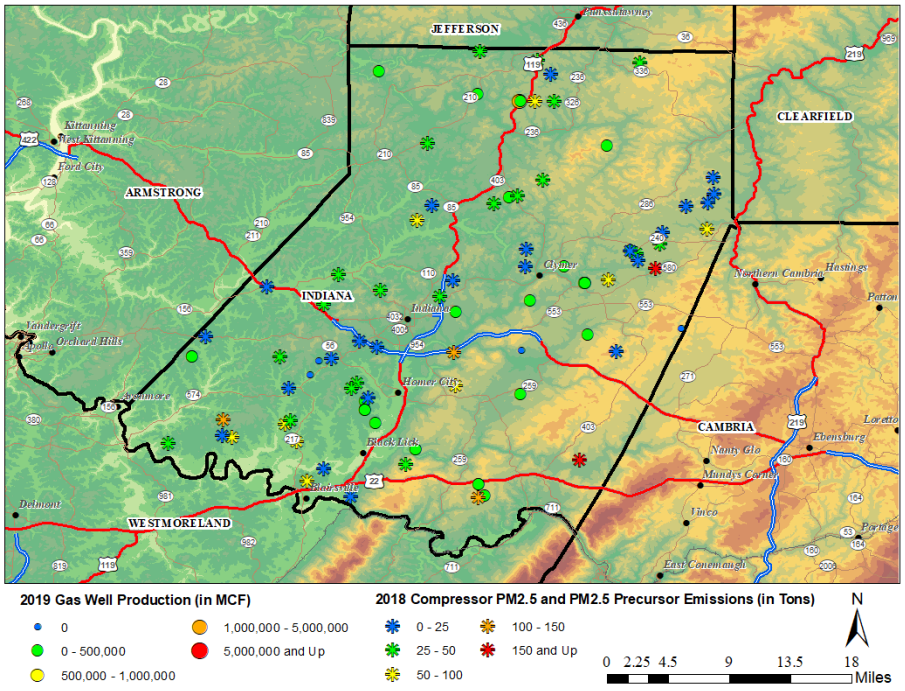
Over the past several years, DEP has received multiple public comments on its annual air monitoring network plans, expressing concern over short-term exposure to pollutants in relation to shale gas activities and the effect on susceptible populations including children, or those with respiratory difficulties. In addition, there has been an increase in the number of complaints to DEP's regional offices concerning shale gas operations.

As outlined in previous annual network plans, DEP has continued to establish new monitoring sites in shale gas producing counties across the Commonwealth. In 2019, DEP established two new monitoring sites, Salladasburg in Lycoming County and Tunkhannock in Wyoming County. DEP installed continuous $PM_{2.5}$ monitors at both locations. At the Tunkhannock site, DEP also installed air toxics monitoring for carbonyls using EPA Method 8315A and VOC using EPA Method TO 15. DEP's plans for additional $PM_{2.5}$ monitoring activities in Indiana County is outlined in the following subsection.

Addition of $PM_{2.5}$ Monitoring to Existing Strongstown Site in Indiana County

DEP plans to establish $PM_{2.5}$ monitoring in Indiana County in 2020. Indiana County has 57 compressor stations and 32 gas wells that reported production in 2018 and 2019, respectively. Figure 5 highlights the locations of the compressor station and gas well production with respect to topography within Indiana County.

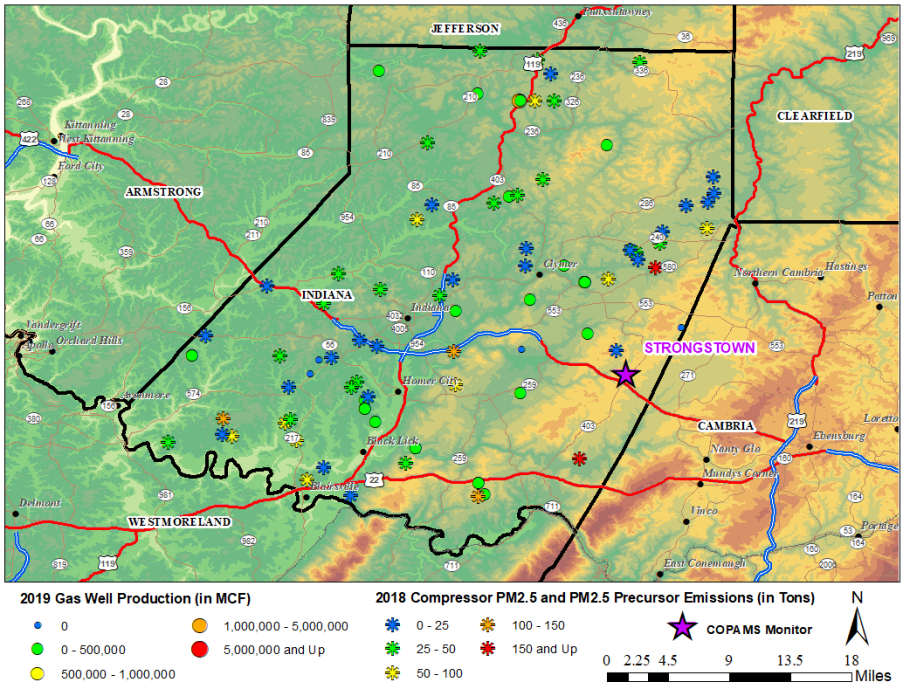
Figure 5. Indiana County Compressor Stations and Gas Well Production



During 2019-2020, DEP visited Indiana County to identify feasible locations for a new monitoring site, ideally situated to capture $PM_{2.5}$ impacts associated with shale gas activities. Similar to the site availability issue previously encountered in McKean County (as outlined in DEP's 2018 Ambient Air Monitoring Plan), DEP found that the compressor station and gas well locations in Indiana County are in remote areas of the county, with limited or no locations immediately downwind suitable to site an air monitoring station. In light of this issue, DEP has assessed the suitability of its existing Strongstown monitoring site location to capture $PM_{2.5}$ impacts from shale gas activities in Indiana County.

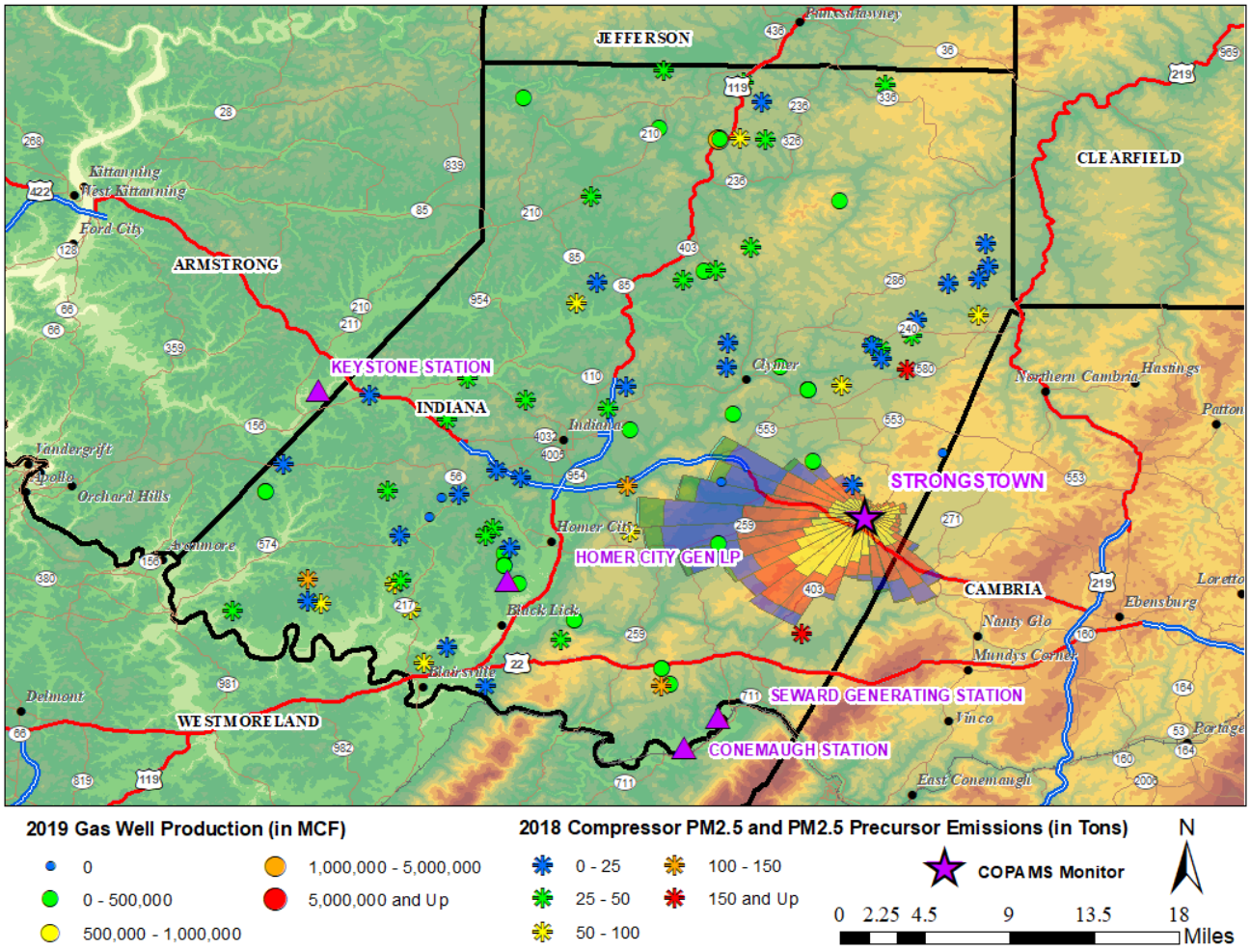
DEP's Strongstown monitoring site (AQS ID 42-063-0004), is located near Strongstown, PA, in far eastern Indiana County. The monitoring site is located just north of Route 422, in some of the highest topography within the county.

Figure 6. Indiana County Compressor Stations and Gas Well Production, with DEP's Strongstown Monitoring Site



In order to understand the general wind flow across the county, DEP analyzed Automated Surface Observing System (ASOS) meteorological data from the John Murtha Johnstown – Cambria County Airport (KJST). KJST was chosen because it was the same dataset that was used for DEP's State Implementation Plan (SIP) revision for the Indiana, PA nonattainment area for the 2010 1-Hour SO_2 NAAQS. Within the SIP revision, DEP outlined why KJST was representative for much of the flow across Indiana County. In this case, KJST can be used to demonstrate the flow approaching the Strongstown site, since it is situated on elevated terrain in eastern Indiana County. Even though KJST resides in Cambria County, the wind rose for KJST in Figure 7 was overlaid on the Strongstown monitor location to illustrate prevailing wind flow as it approaches Strongstown.

Figure 7. Indiana County Compressor Stations and Gas Well Production, with DEP's Strongstown Monitoring Site and Representative Windrose



The KJST wind rose demonstrates that air pollution measurements recorded at the Strongstown site may represent source emission impacts from a broad expanse of upwind geography and meteorological conditions, including a large portion of gas-related activities in Indiana County. Importantly, the Strongstown monitoring location is predominantly downwind of many of the larger emitting compressor stations. In addition, the Strongstown monitor is downwind of the four major power plants in the Indiana County 1-hour SO_2 nonattainment area, identified by the triangles in the figure (in the atmosphere, SO_2 forms ammonium sulfate, which is a major precursor for secondary $PM_{2.5}$ formation across Pennsylvania).

Based on the distribution of the $PM_{2.5}$ primary and secondary source emission locations downwind of DEP's Strongstown monitoring site, DEP has determined that its existing Strongstown location is favorably sited to capture $PM_{2.5}$ impacts from major emitting compressor stations within Indiana County, as well as from four major power plants in the region. Even though the Strongstown site is not immediately downwind of any one compressor station, it is likely that $PM_{2.5}$ concentrations measured at the Strongstown monitoring site are conservative in terms of correlating $PM_{2.5}$ concentrations at the monitor and a $PM_{2.5}$ monitor directly downwind of just compressor stations.

DEP will establish $PM_{2.5}$ monitoring at its Strongstown site during the second half of 2020.

Modifications to Criteria Pollutant Networks

Discontinue the Spring Grove Monitoring Site

DEP intends to discontinue its Spring Grove SO_2 monitoring site, which was installed to satisfy the requirements of the SO_2 Data Requirements Rule (DRR). As set forth in 40 CFR Part 51.1203(c)(3), a monitor established for this purpose may be discontinued if it meets the following conditions:

"(3) Any SO_2 monitor identified by an air agency in its approved Annual Monitoring Network Plan as having the purpose of meeting the requirements of this paragraph (c) that: Is not located in an area designated as nonattainment as the 2010 SO_2 NAAQS is not also being used to satisfy other ambient SO_2 minimum monitoring requirements listed in 40 CFR part 58, appendix D, section 4.4; and is not otherwise required as part of a SIP, permit, attainment plan or maintenance plan, may be eligible for shut down upon EPA approval if it produces a design value no greater than 50 percent of the 2010 SO_2 NAAQS from data collected in either its first or second 3-year period of operation. The air agency must receive EPA Regional Administrator approval of a request to cease operation of the monitor as part of the EPA's action on the Annual Monitoring Network Plan under 40 CFR 58.10 prior to shutting down any qualifying monitor under this paragraph (c)."

The Spring Grove monitoring site was installed to characterize SO_2 impacts on air quality from two SO_2 emission sources in York County, Magnesita Refractories Co. and Pixelle Specialty Solutions (formerly PH Glatfelter). The monitoring site was installed in Jackson Township, in an area determined to provide for maximum air quality impacts based on modeling. As detailed in DEP's 2019 Annual Network Plan, modeling for siting purposes was performed using guidance outlined within the SO_2 DRR Source-Oriented Monitoring Technical Assistance Document, (TAD).[5] SO_2 monitoring began at the site January 1, 2017. EPA Region III approved of the location of the monitor prior to operation of the site.

The Spring Grove monitor is not located in an SO_2 non-attainment area, and is not required by a SIP, permit, attainment plan or maintenance plan. York County, PA is part of the York-Hanover, PA MSA. As described in the "Sulfur Dioxide (SO_2) Network Design Requirements" section in Appendix C of this document, minimum monitoring requirements require one SO_2 monitor to be maintained in the York-Hanover MSA. DEP operates an SO_2 monitor at its York monitoring site, meeting this requirement.

Table 6 displays the maximum daily 1-hour SO_2 averages measured during 2017-2019, as well as the annual 99th percentile values and calculated 3-year design value. As shown, the Spring Grove monitor measured no hourly concentration greater than ½ the 75 ppb SO_2 1-hour NAAQS (37.5 ppb), with the 3-year design value of 6 ppb, or approximately 1/12th the level of the 1-hour NAAQS.

[5] https://www.epa.gov/sites/production/files/2016-06/documents/so2monitoringtad.pdf

Table 7. Summary of SO_2 Concentrations at the Spring Grove Monitoring Site

Summary of Daily Maximum 1-Hour SO_2 Concentration Averages, in ppb			
	2017	**2018**	**2019**
Ranked Maximum			
1	36.3	16	24.1
2	8.2	9.3	14.1
3	7.2	6.7	7.4
4	6.2	5.6	6.5
5	5.9	5.2	5.7
6	5.8	4.9	5.6
7	5.8	4.8	5.6
8	5.2	4.6	5.4
9	4.7	4.5	3.9
10	4.4	4.1	3.9
99th Percentile	**6.2**	**5.6**	**6.5**
Design Value			**6**

On March 6, 2020, DEP submitted and certified all SO_2 measurement data and quality assurance results to EPA through its Air Quality System (AQS) database application. Overall, the low SO_2 concentrations monitored at the Spring Grove site coincide with the general decline in SO_2 emissions from the two SO_2 facilities in York County. Table 7 below illustrates the change in emissions from the time DEP completed in its initial assessment of SO_2 DRR facilities in 2014 and the latest available quality assured three-year period (2016-2018) of emissions. Jointly, these SO_2 facilities saw approximately a 44% reduction in SO_2 emissions from 2014 and the average of the last three years.

Table 8. Trend in SO_2 Emissions from SO_2 DRR Monitoring Pathway Facilities and Respective SO_2 Emissions from 2014 and 2016 to 2018, in tons per year

County	PA Primary Facility ID	Facility	2014	2016	2017	2018	2016-18 Average
York	256841	PIXELLE SPEC SOLUTIONS LLC/SPRING GROVE	6675.6	4554.8	795.9	389.7	1913.4
York	238561	MAGNESITA REFRACTORIES/YORK	1460.7	1134.4	1376.3	1140.9	1217.2

As presented above, the Spring Grove SO_2 monitoring site meets the requirements set forth in 40 CFR Part 51.1203(c)(3) for discontinuation. Considering both the monitoring and facility emission trend, following EPA approval, DEP will discontinue this monitoring site.

Enhanced Monitoring Plan for Ozone

Based on a review of recent air quality data, DEP has determined it would be beneficial to expand the monitoring activities within the Philadelphia ozone nonattainment area. The maximum 2018 8-hour ozone design value within the Pennsylvania portion of the Philadelphia ozone nonattainment area was measured at DEP's Bristol monitoring site, at 0.081 parts per million. Because this value exceeds the 2015 ozone NAAQS of 0.070 parts per million, the Philadelphia nonattainment area is at risk of failing to meet the NAAQS within a three-year time frame promulgated in EPA's 2018 SIP requirements for ozone nonattainment areas (83 FR 62998).[6] Therefore, to supplement the Photochemical Assessment Monitoring Station (PAMS) monitoring being completed by the Philadelphia Air Management Services, DEP will be adding the following monitoring at its Bristol monitoring site, to better evaluate ozone formation and transport across the Philadelphia area:

1) VOC canister – the VOC canister will be in operation year-round. The VOC sampler will then be analyzed for PAMS compounds at least during the required ozone monitoring season (June 1 to August 31)
2) True NO_2 monitor – A true NO_2 monitor is necessary to measure the direct NO_2 within the atmosphere at the Bristol site
3) Ceilometer – A ceilometer is necessary to measure the continuous boundary layer height at the Bristol site
4) Pandora – In partnership with NASA/EPA, DEP will deploy a Pandora spectrometer. The Pandora will be able to measure the total atmospheric column of ozone, NO_2 and formaldehyde over the Bristol site. More information can be found at the following website: https://pandora.gsfc.nasa.gov//index.html.

As of January 1, 2020, DEP has been analyzing its VOC canisters for the PAMS compounds. Later this year, DEP is planning on purchasing its true NO_2 monitor and ceilometer for deployment to its Bristol monitoring site. Also, an additional true NO_2 monitor will be sited at DEP's Arendtsville monitoring site in Adams County. Finally, DEP continues to coordinate with NASA/EPA regarding the deployment timing of the PANDORA spectrometer at the Bristol monitoring site.

[6] https://www.federalregister.gov/documents/2018/12/06/2018-25424/implementation-of-the-2015-national-ambient-air-quality-standards-for-ozone-nonattainment-area-state.

Appendix A - General Descriptions of Air Pollutants

Ozone (O_3)

Ground-level ozone, or photochemical smog, is a secondary pollutant. Ozone is generally not emitted directly into the atmosphere as ozone, but rather is formed by chemical reactions between other air pollutants. The primary pollutants involved in these reactions – volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) – form ozone in the presence of sunlight and warm temperatures. Thus, sources that emit these ozone precursors are sources of ozone. Nitrogen oxides result from fossil fuel combustion and sources commonly include power plants, industrial boilers, and motor vehicles. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, and even natural (biogenic) sources. Ozone and the precursor pollutants that cause ozone also can be transported into an area from pollution sources located hundreds of miles away. Because the formation of ozone is boosted by increasing sunlight and temperatures, changing weather patterns contribute to yearly differences in ozone concentrations, with peak concentrations occurring during the summer months.

Ground-level ozone is a strong irritant to the eyes and upper respiratory system and can hamper breathing. It also damages vegetation, including forest and agricultural crops, and man-made materials such as monuments and statues.

Ozone is measured by ultraviolet absorption photometry. Air is drawn through a sample cell where ultraviolet light (254 nm wavelength) passes through it. Any light that is not absorbed by the ozone is then converted into an electrical signal proportional to the ozone concentration.

Sulfur Dioxide (SO_2)

Sulfur dioxide is a gaseous pollutant that is emitted primarily by industrial furnaces or power plants burning sulfur-containing coal or oil. The major health effects associated with high exposures to sulfur dioxide include effects on breathing and respiratory illness symptoms. The population most sensitive to sulfur dioxide includes asthmatics and individuals with chronic lung disease or cardiovascular disease. Sulfur dioxide damages vegetation, including forests and agricultural crops, and acts as a precursor to acid rain. Finally, sulfur dioxide can accelerate the corrosion of natural and man-made materials that are used in buildings and monuments, as well as paper, iron-containing metals, zinc, and other protective coatings.

Sulfur dioxide is measured with an ultraviolet fluorescence analyzer. Air is drawn through a sample cell where it is then subjected to high intensity ultraviolet light. This causes the sulfur dioxide molecules in the air to fluoresce and release light. The fluorescence is detected with a photomultiplier tube and converted to an electrical signal proportional to the SO_2 concentration.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is a highly toxic, reddish brown gas that is created primarily from fuel combustion in industrial sources and vehicles. It creates an odorous brown haze that causes eye and sinus irritation, blocks natural sunlight and reduces visibility. It can severely irritate the respiratory system and has been associated with acute effects in individuals diagnosed with respiratory disease. Nitrogen dioxide contributes to the creation of acid rain and plays a key role in nitrogen loading, adversely impacting forests and other ecosystems.

Nitrogen oxides (NO_x) are measured using the chemiluminescence reaction of nitric oxide (NO) with ozone (O_3). Air is drawn into a reaction chamber where it is mixed with a high concentration of ozone from an internal ozone generator. Any nitric oxide mixes with ozone to produce NO_2. Light from this reaction is detected with a photomultiplier tube and converted to an electrical signal proportional to the nitric oxide concentration. Total nitrogen oxides are measured by passing the air through a converter where any NO_2 in the air is reduced to nitric oxide before the air is passed to the reaction chamber. By alternately passing the air directly to the reaction chamber and through the converter before the reaction chamber, the analyzer alternately measures nitric oxide and NO_x. Nitrogen dioxide (NO_2) is measured indirectly by a subtraction of the NO from the NO_x concentrations.

Carbon Monoxide (CO)

Carbon monoxide is a byproduct of the incomplete burning of fuels. Industrial processes contribute to carbon monoxide pollution levels, but the largest man-made source of carbon monoxide is motor vehicle emissions. This pollutant is a health concern in areas of high traffic density or near industrial sources. Peak carbon monoxide concentrations typically occur during the colder months of the year when automotive emissions are greater and nighttime inversion (a weather-related phenomenon) conditions are more frequent.

Carbon monoxide is a colorless, odorless, poisonous gas that has an affinity for hemoglobin, 210 times that of oxygen. By combining with the hemoglobin in the blood, it inhibits the delivery of oxygen to the body's tissue, thereby causing or shortness of breath, asphyxia, and eventually death. The health threat from carbon monoxide is most serious for those who suffer from cardiovascular disease. At much higher levels of exposure, healthy individuals are also affected.

Carbon monoxide is measured by infrared absorption photometry. A continuous flow of air is drawn through a sample cell where infrared light passes through it. The carbon monoxide molecules absorb a portion of the infrared light. This reduces the amount of light getting to the sensor. The light is then converted into an electrical signal related to the concentration of carbon monoxide in the sample cell.

Fine Particulate Matter ($PM_{2.5}$)

Fine particulate matter emissions result primarily from industrial processes and fuel combustion - including motor vehicles, residential wood burning, and forest or agricultural fires.

Fine particles can accumulate in the respiratory system and are associated with numerous adverse health effects, including decreased lung function and increased respiratory symptoms and disease. Sensitive groups that appear to be at greatest risk include the elderly, individuals with cardiopulmonary disease such as asthma, and children. $PM_{2.5}$ is the major cause of reduced visibility in parts of the United States. Other environmental impacts occur when particles deposit onto soil, plants, water, or man-made materials such as monuments or statues.

For the manual Federal Reference Method (FRM) sampler, $PM_{2.5}$ is sampled by drawing air through a specially designed inlet that excludes particles larger than 2.5 microns in diameter. The particles are collected on a Teflon™ Microfiber filter that is removed and subsequently weighed by the Bureau of Laboratories to determine the particulate mass. The normal sampling schedule is for a 24-hour sample to be taken daily. For the continuous methods, DEP utilizes both the Teledyne Model 602 BetaPLUS and Teledyne Model T640 monitors. The Teledyne 602 BetaPLUS monitor collects $PM_{2.5}$ on an internal filter. It then uses a radioactive isotope to emit low energy levels of beta radiation through the

filter. As the radiation passes through matter, its intensity is diminished, or attenuated (beta attenuation). The mass of $PM_{2.5}$ is calculated by measuring the beta radiation intensity before and after sampling on the filter. The Teledyne T640 collects particulate matter into an optical particle sensor where scattered light intensity from a polychromatic light source is measured to determine particle size diameter.

Particulate Matter (PM_{10})

PM_{10} appears to represent essentially all of the particulate emissions from transportation sources and most of the emissions in the other traditional categories (coal-burning power plants, steel mills, mining operations, etc.).

Sources of PM_{10} particles may include dust-producing process, such as crushing or grinding operations, as well as dust stirred up by vehicles traveling on roads. While they are not as much of a health concern as are fine particles, they can aggravate respiratory conditions and irritate the linings of the eyes, nose, throat and lungs. In the environment, PM_{10} contributes to reduced visibility and degradation of man-made materials.

PM_{10} is sampled continuously using a tapered element oscillating microbalance (TEOM). Air is drawn through a specially designed inlet that excludes particles larger than 10 microns in diameter. Particle accumulation causes changes in the microbalance oscillation that are recorded by the instrument.

Lead (Pb)

Lead is emitted to the atmosphere primarily from certain industrial processes, such as battery manufacturers and lead smelters. A portion of the private aviation sector is an additional source of lead emissions. As a result of the reduction in lead in gasoline, metal processing is now the major source of lead emissions.

Lead is a highly toxic metal when ingested or inhaled. It is a suspected carcinogen of the lungs and kidneys and has adverse effects on the cardiovascular, nervous, and renal systems.

The amount of lead in ambient air is measured by laboratory analysis of TSP filters using Inductively Coupled Plasma - Mass Spectrometry.

Air Toxics

Hazardous air pollutants (HAPs), commonly referred to as air toxics, are pollutants known to cause or are suspected of causing cancer or other serious human health effects or ecosystem damage. Some air toxics are released from natural sources such as volcanic eruptions and forest fires. Most air toxics originate from mobile sources (cars, trucks, buses) and stationary sources (factories, refineries, power plants). Examples of some of the 187 toxic air pollutants include heavy metals such as mercury and chromium; benzene, found in gasoline; perchloroethylene, emitted from some dry cleaning facilities; and methylene chloride, used as a solvent and paint stripper by a number of industries.

Appendix B – Sites by CBSA and Non-CBSA Region

Appendix B of this document displays maps of monitoring network sites organized by Core-Based Statistical Area (CBSA) regions, as described in the "Description of DEP's Ambient Air Monitoring Network" section of this document. CBSA are listed in alphabetical order, by type. Metropolitan Statistical Areas (MSAs) are listed first, followed by Micropolitan statistical Areas (Micro Areas) and non-CBSA regions. Table B-1. Core-Based Statistical Areas and Pennsylvania Counties below lists the CBSAs and non-CBSA regions, in order of presentation, along with their component Pennsylvania counties. Note that areas listed in Table B-1. Core-Based Statistical Areas and Pennsylvania Counties, but not included in the following maps, do not contain monitoring sites operated by DEP. On the individual CBSA maps, proposed additional sites are highlighted in **blue**. Proposed discontinued sites are highlighted in **red**.

Table B-1. Core-Based Statistical Areas and Pennsylvania Counties

CBSA Name	County (Pennsylvania Portion)
Metropolitan Statistical Areas (MSA)	
Allentown-Bethlehem-Easton MSA	Carbon, Lehigh, Northampton
Altoona, PA-NJ MSA	Blair
Bloomsburg-Berwick, PA MSA	Columbia, Montour
Chambersburg-Waynesboro, PA MSA	Franklin
East Stroudsburg, PA MSA	Monroe
Erie, PA MSA	Erie
Gettysburg, PA MSA	Adams
Harrisburg-Carlisle, PA MSA	Cumberland, Dauphin, Perry
Johnstown, PA MSA	Cambria
Lancaster, PA MSA	Lancaster
Lebanon, PA MSA	Lebanon
New York-Newark-Jersey City MSA	Pike
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	Bucks, Chester, Delaware, Montgomery, Philadelphia
Pittsburgh, PA MSA	Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, Westmoreland
Reading, PA MSA	Berks
Scranton-Wilkes-Barre-Hazleton MSA	Lackawanna, Luzerne, Wyoming
State College, PA MSA	Centre
Williamsport, PA MSA	Lycoming
York-Hanover, PA MSA	York
Youngstown-Warren-Boardman, OH-PA MSA	Mercer
Micropolitan Statistical Areas	
Bradford, PA Micropolitan Area	McKean
DuBois, PA Micropolitan Area	Clearfield
Huntingdon, PA Micropolitan Area	Huntingdon

CBSA Name	County (Pennsylvania Portion)
Indiana, PA Micropolitan Area	Indiana
Lewisburg, PA Micropolitan Area	Union
Lewistown, PA Micropolitan Area	Mifflin
Lock Haven, PA Micropolitan Area	Clinton
Meadville, PA Micropolitan Area	Crawford
New Castle, PA Micropolitan Area	Lawrence
Oil City, PA Micropolitan Area	Venango
Pottsville, PA Micropolitan Area	Schuylkill
Sayre, PA Micropolitan Area	Bradford
Selinsgrove, PA Micropolitan Area	Snyder
Somerset, PA Micropolitan Area	Somerset
St. Marys, PA Micropolitan Area	Elk
Sunbury, PA Micropolitan Area	Northumberland
Warren, PA Micropolitan Area	Warren
Non-CBSA Regions	
Northcentral Non-CBSA Region	Cameron, Potter, Sullivan, Tioga
Northeast Non-CBSA Region	Susquehanna, Wayne
Northwest Non-CBSA Region	Clarion, Forest, Jefferson
Southcentral Non-CBSA Region	Bedford, Fulton, Juniata
Southwest Non-CBSA Region	Greene

Figure B-1. Allentown-Bethlehem-Easton, PA-MJ MSA (Pennsylvania portion)

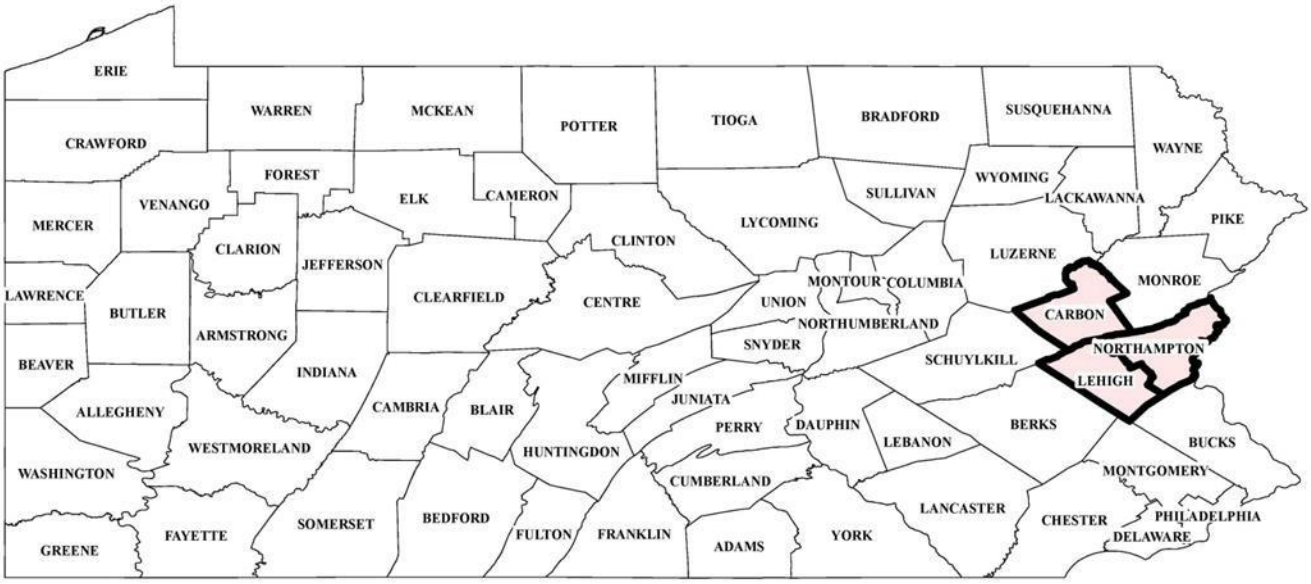


Figure B-2. Allentown-Bethlehem-Easton, PA-NJ MSA (Pennsylvania portion) Site Detail

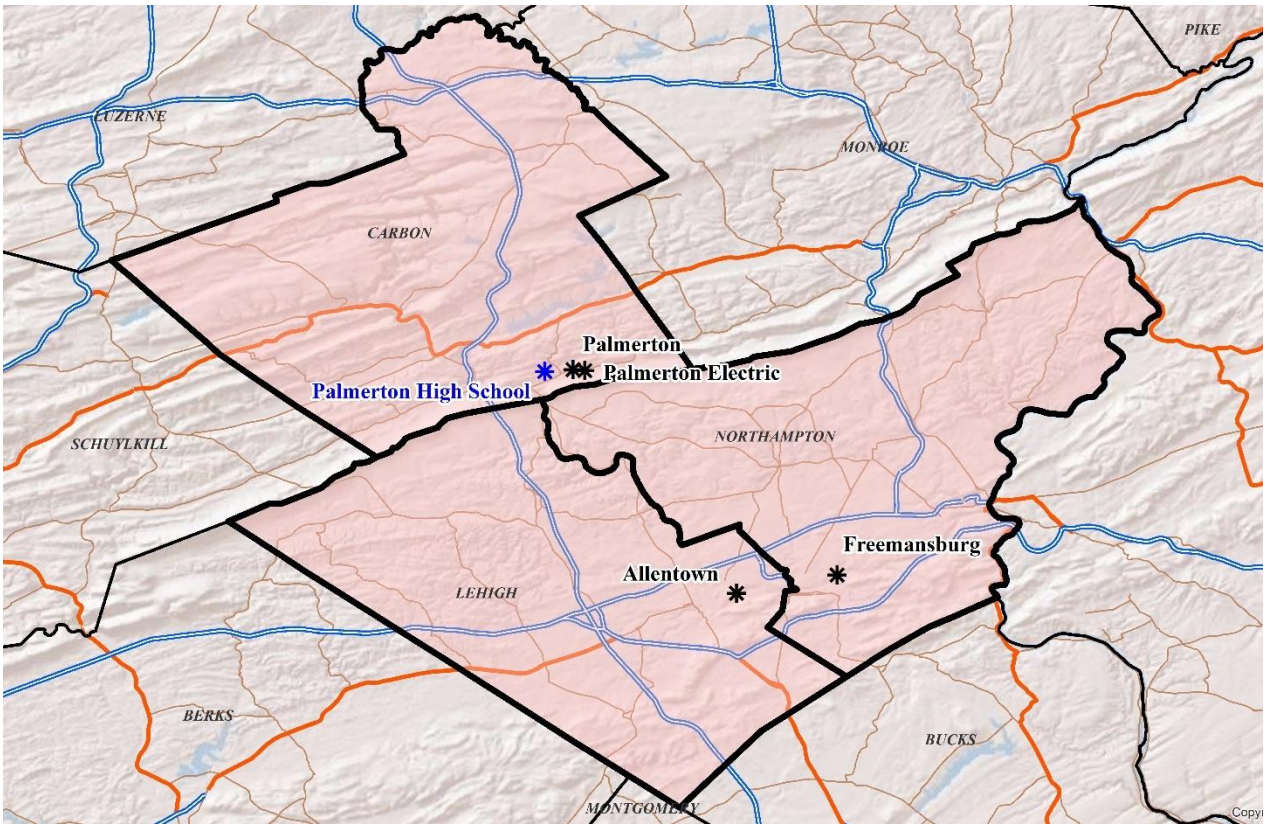


Figure B-3. Altoona, PA MSA

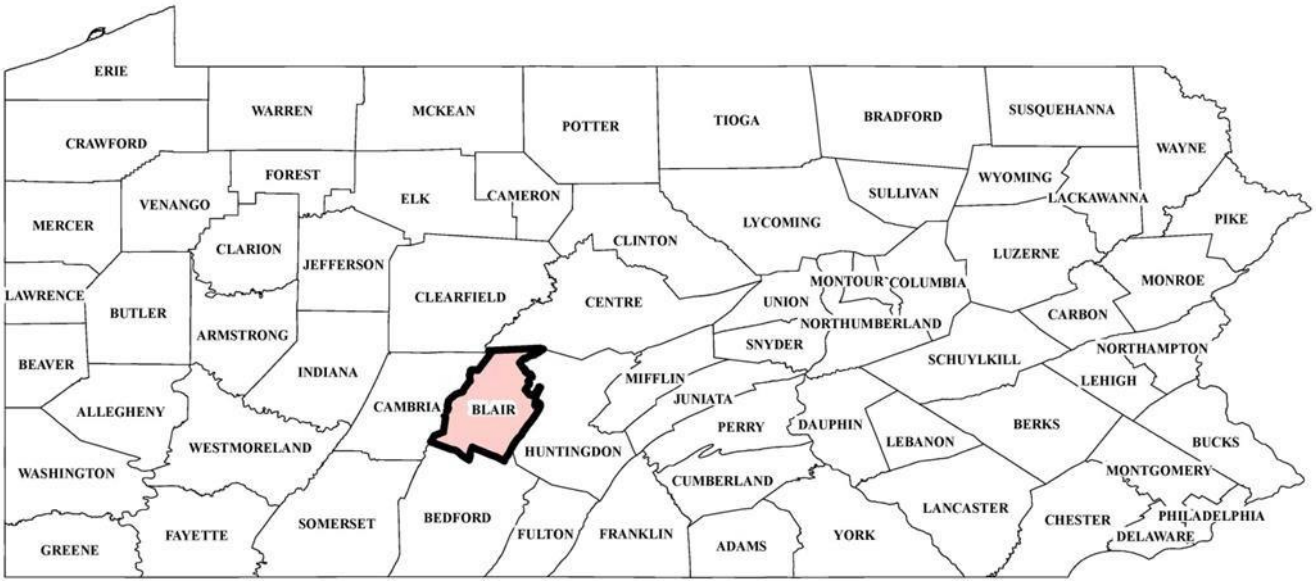


Figure B-4. Altoona, PA MSA Site Detail